Fracture of the ultra high molecular weight polyethylene (UHMWPE) mobile bearing component is a rare complication following total ankle replacement (TAR). The mechanism and etiology of these fractures is poorly characterized. This case series is the largest report of this replacement (TAR). The mechanism and etiology of these fractures is poorly characterized. This case series is the largest report of this replacement (TAR).

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A retrospective chart review was performed of all primary TAR cases at our institution from 2008-2014. A total of 156 mobile bearing TAR cases were identified. Follow up ranged from one to seven years following TAR implantation. Revision surgeries and patient characteristics for those suffering polyethylene fracture were assessed including patient demographics, component size, preoperative coronal plane deformity, mechanism of injury, and fracture morphology.

Patients with UHMWPE fractures who underwent TAR revision were reviewed. Revision only required exchange of the UHMWPE in two cases. In one case, the tibial tray and UHMWPE were replaced. In one case, the shoulder of the talar component was considered acceptable as the mobile bearing ankle arthroplasty. Like patients in this study, all patients experienced insidious ankle pain, yet failure occurred in the same coronal plane as the patient was preoperatively. No fractures occurred in the sagittal plane.

The UHMWPE has been sterilized with gamma irradiation in a nitrogen vacuum since 1998 which reduces polyethylene weakness induced by sterilization process. Polyethylene fractures may be more common in mobile bearing total ankle implants and be related to the polyethylene thickness. One knee arthroplasty literature suggests only polyethylene 8 mm or thicker should be utilized to keep contact surfaces below the yield strength of the UHMWPE. As seen in this study, all patients with fracture had a relatively thin UHMWPE, either 6 or 7 mm. Additionally if the coronal plane alignment is not corrected edge loading can result and cause polyethylene dissolution and induce component wear and associated pain, ultimately leading to failure of polyethylene component. All patients included in our study had a preoperative coronal plane deformity which appeared corrected postoperatively, yet failure occurred in the same coronal plane as the patient was preoperatively.

In our review of 156 implants performed by a single surgeon with follow up ranging from one to seven years, there were a total of five cases of UHMWPE fracture identified, a 3.2% incidence. Of 156 mobile bearing TARs, a total of five cases of UHMWPE fracture were identified, an incidence of 3.2%. Average patient weight was 99 kg at the time of fracture (range 94-107 kg). One patient was female, the remaining four patients were male. Average age at time of fracture was 68.6 years old. Three of the five patients were carrying a heavy load at the time of fracture. Four patients had a preoperative ankle valgus deformity and one patient had a preoperative ankle varus deformity. Coronal plane deformity was corrected intraoperatively at index surgery with the tibial resection. Additional ancillary ligamentous procedures were performed in three cases. Mean time to mobile bearing fracture from initial TAR implantation was 38.8 months (range 27.45 months). Tibiotalar thickness was 6 mm in three cases and 7 mm in two cases. The UHMWPE was on average 2.3 mm larger at revision surgery compared to the UHMWPE initially implanted. Fractures occurred in the coronal plane in three cases, but occurred only through the shoulder of the talar component in one case (Figures 1, 5). No fractures occurred in the sagittal plane.

Discussion and Literature Review

Though UHMWPE fracture is an uncommon occurrence, certain patients may be more at risk for this potentially catastrophic complication. As the dimensions of the UHMWPE do not change to account for increased implant size, increased forces from a larger tibial tray are placed across the mobile bearing component. Cases associated with mobile bearing fractures are patients with a heavier weight or who are carrying heavy loads as they will place more force through the same size mobile bearing component. Polyethylene fractures are not exclusive to mobile bearing implants as Assal et al. reported one case of a polyethylene fracture in a patient that underwent a semi-constrained total ankle arthroplasty. One patient had a preoperative ankle varus deformity and one patient had a preoperative ankle valgus deformity. Like patients in this study, all patients experienced insidious ankle pain, but sometimes a specific incident was identified and plain radiographs revealed the tibial tray in contact with the talar component (Figures 3, 4).

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Results

Of 156 mobile bearing TARs, a total of five cases of UHMWPE fracture were identified, an incidence of 3.2%. Average patient weight was 99 kg at the time of fracture (range 94-107 kg). One patient was female, the remaining four patients were male. Average age at time of fracture was 68.6 years old. Three of the five patients were carrying a heavy load at the time of injury. Four patients had a preoperative ankle valgus deformity and one patient had a preoperative ankle varus deformity. Coronal plane deformity was corrected intraoperatively at index surgery with the tibial resection. Additional ancillary ligamentous procedures were performed in three cases. Mean time to mobile bearing fracture from initial TAR implantation was 38.8 months (range 27.45 months). Tibiotalar thickness was 6 mm in three cases and 7 mm in two cases. The UHMWPE thickness was 6 mm in three cases and 7 mm in two cases. The UHMWPE was on average 2.3 mm larger at revision surgery compared to the UHMWPE initially implanted. Fractures occurred in the coronal plane in four cases, but occurred only through the shoulder of the talar component in one case (Figures 1, 5). No fractures occurred in the sagittal plane.

Mobile Bearing Fractures Following Total Ankle Replacement

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Methodology & Study Design

A retrospective chart review was performed of all primary TAR cases at our institution from 2008-2014. A total of 156 mobile bearing TAR cases were identified. Follow up ranged from one to seven years following TAR implantation. Revision surgeries and patient characteristics for those suffering polyethylene fracture were assessed including patient demographics, component size, preoperative coronal plane deformity, mechanism of injury, and fracture morphology.

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